REMARKS

Claims 1-7 and 30-32 were rejected under 35 U.S.C.§112, second paragraph for failing to particularly point out and distinctly claim the subject matter that the applicant regards as the invention.

Reconsideration is requested.

The basis of the rejection was the absence of a word from claim 1, line 11 and the same omission in claims 30-32. Claims 1, 30, 31 and 32 have been amended to insert the word "air" after the term --pre-heated--. For this reason, it is requested that this ground of rejection be withdrawn.

Claims 1, 3, 5, 7, 8, 10 and 30-32 were rejected under 35 U.S.C.§103(a)as being anticipated by Hovis in view of Cornelius or Wunning. Claims 2, 3, 5, 7, 8 and 10 were rejected under 35 U.S.C.§102(b)as being anticipated by Hovis in view of Cornelius or Wunning further in view of JP 07-190319. Claims 4, 10,-21 and 26-29 were rejected under 35 U.S.C.§103(a)as being anticipated by Hovis in view of Cornelius or Wunning, JP 07-1190319. AT358702 was mentioned in the discussion of the rejection of claims 2, 3 5. 7. 8 and 10 but was not applied in the statement of the rejection.

Reconsideration is requested.

Claim 1 has been combined with claim 2 and a recitation of the positioning of the calibrated holes as being located between the central hole and the nozzles has been added to claim 1. A corresponding amendment has been made in claims 30-32. The basis for this amendment is original claim 2 and Fig. 8 of the drawings which shows the positioning of the calibrated holes 16 in relation to the central hole 19 and the nozzles 20.

Hovis discloses a gas burner that always operates in a flame condition. The Hovis invention was directed to solving the problem of providing a burner capable of being efficiently operated during both the starting heating period and the final end period of a soaking cycle in a soaking-pit furnace. Hovis is not concerned with the problem of reducing NOx emissions.

The Hovis gas burner has a plurality of fuel and air nozzles which are arranged around what is labelled as an inner fuel nozzle 90'(Fig. 10). The arrangement when valve 134 is positioned in the 134a position provides a pattern of fuel-air-fuel-air-fuel; in position 134b, the pattern is air-fuel-air and when adjusted for simultaneous operation of 134a and 134b (col. 10, lines 46-55), the pattern of operation is air-fuel-air-fuel-air-fuel-air. The pattern recited in amended claim 1 is fuel-air-air-fuel-air-air-fuel.

The arrangement of the gas and pre-heated air feeds in amended claim 1 is not disclosed or suggested by Hovis or any of the cited references.

Hovis does not disclose a gas burner comprising a refractory unit as pointed out in claims 30-32. The Hovis burner has outer air passages 80', which communicate with a respective "plenum" as shown in figure 8, there is a volume defined around the conduit 92 and, in figure 10, the volume is defined by the chamber 140 and inner air passages 88'. These passages communicate with another "plenum", and as shown in figure 8, the volume defined inside the conduit 92 and, in figure 10, the volume defined by the chamber 138 are different and separate from the "plenum" communicating with the outer air passages 80'.

Claims 1 and 30-32 and the claims that depend from these claims, point out that the calibrated holes 16 and the nozzles 20, which are defined in the second annular region of the refractory unit, are both in communication with the same plenum. Moreover, in claims 30-32, both the calibrated holes 16 and the nozzles 20 are arranged between the inner central lance and the outer side lances. The outer side lances are arranged radially outward from the inner central lance and the calibrated holes 16 and nozzles 20

The Corneilius patent only discloses a combustion apparatus for a gas turbine wherein there is one single spray nozzle 16 that is fed by a fuel pipe 18 and two arrangements of adjusting ports for the introduction of primary and secondary air. The Cornelius turbine combustion apparatus operates in a swirl-mode and in normal-mode, the switching from one mode to the other, as well as the rate of dilution of the combustion products, is achieved by

means of primary and secondary air flow adjusting means. There is a mention of "substantially invisible burning" at col. 7, lines 4-5 that results from expelling the flame from the pre-chamber. This is not the same as flameless combustion as pointed out in claims 1 and 30-32. In any event, the structure of the turbine combustion apparatus does not suggest the multi-fuel feed inlets and multi-preheated air inlets of Hovis so that one skilled in the art would look to Cornelius for modifications.

Wunning discloses an impulse burner which can be utilized for indirectly heating a furnace chamber by means of radiator heating tube (figure 5 of Wunning). In said impulse burner the fuel inner central lance 18 and the fuel outer side lance 17 are coaxial one another, the fuel inner central lance 18 protrudes axially from the fuel outer central lance 17, the latter ending inside a combustion chamber 9 that is part of the impulse burner itself. In the impulse burner the air is introduced into the combustion chamber 9 and, from there it passes into the furnace chamber or radiator heating tube through openings which are arranged outwardly with respect to the fuel coaxial inner and side lances 18 and 17.No refractory unit is present in the Wunning impulse burner.

The Wunning impulse burner operates in a flame-mode, wherein the fuel is injected into said combustion chamber through the fuel outer side lance 17, and a flameless mode, where the fuel is injected into the furnace chamber or radiator heating tube through the fuel inner lance 18. In the gas burner of the present application the fuel outer side lances are arranged radially outwardly with respect to the inner central lance in that the fuel outer side lances are radially distanced from the fuel inner central lance. Moreover, the gas burner claimed in the present application comprises a refractory unit which is completely absent in the Wunning impulse burner. Finally, in the gas burner pointed out in new claims 30-32, the calibrated holes 16 and the nozzles 20 through which the air is drawn are both arranged between the fuel inner central lance 11 and the fuel outer side lances 10.

The structural differences of the claimed gas burner are not made

obvious by the cited references. The Wunning impulse gas burner because of its compactness and the symmetry of its structure, is capable of operating in a relatively small furnace chamber, developing in a substantially axial direction and free from obstacles, such as the one of a radiator heating tube. However, the Wunning impulse gas burner is not capable of operating in a oven, such as an industrial oven for the treatment of metallic pieces, wherein the combustion chamber can be very large in dimensions and the metallic pieces treated therein can be very bulky so as to impact the fuel and the air axially exiting from the impulse gas burner which can impede the mixing thereof with the combusted gas that is present in the combustion chamber.

On the contrary, the gas burner claimed in the present application, because of the radially disposed outward arrangement of the at least two fuel outer side lances with respect to the nozzles 20 and the calibration holes 16 result in a good mixing of the combustible gas, the comburent air and the combusted gas inside a furnace chamber without the formation of a flame front even in combustion chambers having large dimensions when the furnace chamber is occupied by obstacles.

The coaxial arrangement of the inner and outer lances of the impulse burner of Wunning cools the lances because of the cold gas injected through them, whereas, in the burner according to the present invention, due to the arrangement of the outer side lances radially outwardly with respect to the inner central lance, it is necessary to provide an additional cooling system (the annular crown around the pit portion of the inner central lance, which is the one more subjected to heat).

It is further noted, that in the flame operating mode of the Wunning burner, the fuel is fed through the outer lance 17, whereas in the "flame free" operating mode the fuel is fed through the inner lance 18, the inner lance 18 being axially arranged inside the outer lance 17.

The AT358702 patent disclosed elements labeled with the reference numeral "13" which are not fuel lances, as they are "swirling" elements inserted inside through holes 12 for the passage of air (Cf. claim 6 of

AT358702).It is further noted that the said through holes 12 for the passage of air are located outside the conduits 15 and 16 that feed gas and oil fuel.

JP 07-190319 discloses a multistage burner where a stable flame is formed by the use of baffles which comprise a plurality of passages. There is no mention of a central lance with outer side lances for feeding fuel to a burner. Nothing in JP 07-190319 suggests the structure recited in claim 1 and the claims that depend from claim 1.

Nothing in the cited references makes obvious the claimed arrangement of the fuel and air inlets or the means for introducing pre-heated air or the concept of being able to switch from flame mode to non-flame mode. For these reasons, it is respectfully submitted that the application of the teachings of Wunning, Corneilius, Hovis, AT 358702 or JP 07-190319 results from a hindsight analysis of the claimed invention as these references individually or collectively do not anticipate or make obvious the claimed invention. For these reasons, it is requested that the rejections for obviousness be withdrawn.

An early and favorable action is earnestly solicited.

Respectfully Submitted

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